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ABSTRACT

An evaluation-reward system was developed in which students received points based on a comparison of their weekly quiz performance to a "base score" which was derived from a pretest, and adjusted to reflect actual weekly performance. This system was evaluated in terms of its effect on student achievement, using a group of English classes (409 sixth, seventh, and eighth grade students) studying a nine-week language mechanics unit. The students' points were reported in a weekly class newsletter. The Hoyum-Sanders Junior High School English Test was administered as the pre- and post-test. Results of analysis of covariance indicated that the experimental group achieved more on the final test than did control students, controlling for pretest scores. (Author/GDC)

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EFFECTS OF INDIVIDUAL LEARNING EXPECTATIONS ON STUDENT ACHIEVEMENT

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The Johns Hopkins University

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Introductory Statement

The Center for Social Organization of Schools has two primary objectives: to develop a scientific knowledge of how schools affect their students, and to use this knowledge to develop better school practices and organization.

The Center works through four programs to achieve its objectives. The Studies in School Desegregation program applies the basic theories of social organization of schools to study the internal conditions of desegregated schools, the feasibility of alternative desegregation policies, and the interrelation of school desegregation with other equity issues such as housing and job desegregation. The School Organization program is currently concerned with authority-control structures, task structures, reward systems, and peer group processes in schools. It has produced a large-scale study of the effects of open schools, has developed Student Team Learning Instructional processes for teaching various subjects in elementary and secondary schools, and has produced a computerized system for school-wide attendance monitoring. The School Process and Career Development program is studying transitions from high school to post secondary institutions and the role of schooling in the development of career plans and the actualization of labor market outcomes. The Studies in Delinquency and School Environments program is examining the interaction of school environments, school experiences, and individual characteristics in relation to in-school and later-life delinquency.

This report, prepared by the School Organization program, investigates a method of rewarding students based on how they perform each week compared to their own past performance.

Abstract

This research evaluated the effects on academic achievement of an evaluation-reward system in which students received points based on a comparison of their weekly quiz performance to a "base score" derived from a pretest and adjusted to reflect actual weekly performance. The points were reported in a weekly class newsletter. The study involved 409 sixth, seventh, and eighth grade students in seventeen English classes studying a nine-week Language Mechanics unit. Students who received the experimental treatment (N = 196) achieved more on a final standardized test than did control students (N = 213), controlling for pretest scores.

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One of the most persistent and vexing problems in American education is grading. Grades as they are typically given have few supporters, but almost all teachers give traditional grades (Pinchak and Breland, 1973). As distasteful as it may be, some extrinsic motivation is needed to maintain student academic efforts at a high level. Numerous studies at the college level have shown substantially lower performance in pass-fail courses than in graded courses, even in studies in which the issue of self-selection of students into pass-fail or graded courses has been ruled out (Gold, Reilly, Silberman, and Lehr, 1971).

But are traditional grades optimum motivators of students' academic efforts? Motivational psychology would argue that they are far from ideal. We know that feedback and reinforcement must follow behaviors closely in time to be maximally effective (Bandura, 1969), yet most grades are given every six or nine weeks. We know that the behaviors being rewarded must be well-specified so that students know what is expected of them, yet grades are typically given for a hodge-podge of behaviors, such as attendance, appearance, neatness, compliance, and promptness, as well as actual learning. Perhaps most importantly, we know that any reward must be neither too easy nor too hard for individuals to obtain (Atkinson, 1958). Yet some students enter class with such advanced skills that they need do little to earn A's or B's, while others cannot make acceptable grades no matter how hard they try.

One solution to these problems with grading is to design a system in which students receive regular, timely feedback and rewards based on a comparison of their weekly performance to an individually determined expectation, based on past performance. The question posed in this paper

is whether it is possible and effective to use individually determined standards for performance in the context of class-paced, group instruction. If students can be rewarded in a fair and consistent way for performance that is better than their own past performance level, we might have a simple but effective way to put academic success in equal reach of all students, regardless of their entry skills.

The problems presented by establishing individual criteria for reward are many. Many teachers have attempted to give subjective "effort grades," but have had difficulty separating effort from ability; "effort grades" usually correlate highly with traditional grades. Setting an expectation for students based on a pretest or on past grades produces distortions if the pretest is unreliable or the grade is based on attributes other than academic performance. Students who were mistakenly given expectations that were too low would not have to work up to their full potential, while those whose expectations were set too high would have little chance of success. Further, comparing daily or weekly performance to a pre-set standard has the problem of variations in the difficulty of the daily or weekly activities. It would be meaningless to have students rewarded for exceeding, or punished for not reaching, a pre-set standard if they did so because a particular test was too easy, or too difficult, for everyone in the class.

This study used a method of rewarding students based on how they performed each week as compared to their own past performance that was designed to avoid the above problems. This method is called "Individual Learning Expectations," or ILE. In ILE, an initial "base score" was established for each student based on a 50-item pretest. The class scores were ad-

justed to an arbitrary standard median of 40. That is, if the true class median were 35, five points would be added to each score. This was done so that future quizzes could be easily adjusted to the same median as the pretest. This adjustment procedure was then also applied to weekly quizzes, so that each quiz could be considered equal in difficulty to the pretest, thus removing the problem of variations in quiz difficulty. The "base score" was set ten points below each student's adjusted pretest score to give each student a realistic, individually prescribed minimum score they could be expected to make.

Each week, students took two 25-item quizzes on the material they were studying. Their quiz scores were combined and adjusted to the standard class median (40). Students then received "pluspoints" based on the degree to which their quiz scores exceeded their "base scores." Students earned no pluspoints if they did not make their base score, one if they just made it or exceeded it by 1-2 points, two if they exceeded it by 3-5 points, and so on to a maximum of seven pluspoints for exceeding their base scores by eighteen points or more. Students with perfect papers earned seven pluspoints regardless of their base scores or adjusted scores. Base scores were changed each week to correct any mistakes in the pretest score and to reflect current performance. This adjustment of base scores was one quarter of the difference between the true expected score (the base score plus ten) and the (adjusted) sum of the quiz scores. For example, if a student's base score was 30 and he received a total of 32 points, he would earn one pluspoint (for exceeding his base score by two), but his base score would be adjusted downward to 28, because 32 is eight less than the 40 the student was expected to make, and one-quarter of eight is two

($\frac{32 - 40}{4}$ = -2). If he had earned 40 points, he would have made four pluspoints, but his base score would be unchanged; at a score of 44, he would have earned five pluspoints and had his base score increased by one ($\frac{44 - 40}{4}$ = +1). The net effect of this adjustment is like comparing students' scores to a running average of the last four scores, except that it is less susceptible than a running average to abrupt change due to unusually high or low scores.

Insert Figure 1 Here

Figure 1 shows how pluspoints and new base scores might have been figured for part of a class. The first column marked "Base Score" would have been derived from the pretest and adjusted for any quizzes after the pretest. The base scores are ten points below the expected score for each student (e.g., Antonio, whose base score is 28, would therefore be expected to make a 38 on a 50-item quiz with a median of 40). Students would know their own base scores but not those of other students.

The column marked "adjusted quiz score" contains each student's latest quiz score after adjustment to a class median of 40. These scores, minus the base scores, are translated into "pluspoints," where a difference of 0-2 earns one pluspoint, 3-5 = 2, 6-8 = 3, etc., up to a maximum of 7 for eighteen or more points over the base score. The new quiz score also adjusts the base score. The pluspoints and the new base score are obtained from a chart.

In Figure 1, Antonio had an adjusted quiz score of 34, 6 points more than his base. This gives him three pluspoints. His expected score is 38

(28 + 10), so his base score is reduced by one point ($\frac{34 - 38}{4}$ = -1) to 27. On the chart, the teacher would have read across to find an old base of 28, down to find an adjusted quiz score of 34, and at the intersection would have appeared the notation 3/27, indicating three pluspoints and a new base of 27. Bill exceeded his base score by 23 points, so he earns the maximum (seven pluspoints) and his base score is adjusted upward by three ($\frac{48 - 35}{4}$ = +3.25). Note that Iris, who did not make her base score, received zero pluspoints, and that even though Gary did not exceed his base score by enough to get a seven, he earns seven pluspoints anyway because he got a perfect paper.

In actual practice, the ILE system was not difficult to use. Teachers simply had to find a class median each week, adjust scores, and then consult a chart that gave pluspoints and a new base score for any combination of an old base score and a student quiz score.

The ILE system gives each student a realistic and individually prescribed weekly goal that he or she can attain only by learning the academic material at hand. This study tested the effects of ILE on achievement. It was expected that the ILE students would show greater gains in academic achievement than the control students, and that the benefits of the ILE treatment would be greatest for students low in past performance, for whom the ILE system would provide an increased chance to be successful if the students did their best, and for high-achieving students, for whom ILE would provide a diminished chance to be successful if the students did <u>not</u> do their best.

Method

Subjects. The subjects were 409 sixth, seventh, and eighth graders in four suburban Maryland middle schools. Three of the schools were entirely white, and the fourth was 33% black and 67% white. The overall sample was 92% white and equally male and female. The students were in seventeen English classes taught by eleven teachers.

Design. The experimental design was a simple experimental-control group comparison, with 196 students in eight classes in the experimental group and 213 students in nine classes in the control group. Whenever possible, teachers taught experimental and control classes, where the classes were randomly assigned to treatment within teacher. Four teachers taught one or two experimental classes and one control class. The other seven teachers taught only one class each, and were randomly assigned to experimental or control conditions. Thus, teacher effects are only partially controlled in this design.

All students studied language mechanics for nine weeks, covering two units per week. The units presented material on such topics as capitalization, punctuation, usage, and grammar. Both experimental and control students studied the material on exactly the same schedule. On the first day of the two-day cycle, the teacher presented the lesson. On the second day, students worked on worksheets to learn the material, and took a 25-item quiz at the end of the period. The fifth day of the week, usually Wednesday, was used for other activities.

Treatments. The only difference between the experimental and control groups was in the use made of student scores. In the experimental classes, students were given "base scores" based on a 50-item pretest according to

the procedures outlined above. Students were told that their task was to exceed their base scores by as much as possible. Each week, students were informed of their base scores, the degree to which they exceeded them, and their pluspoints. A weekly class newsletter listed the students who earned five, six, or seven pluspoints. This newsletter was distributed to students each Monday.

In the control classes, students studied the same material on the same schedule, but they simply received grades on their quiz scores. They did not receive base scores, pluspoints, or newsletters.

All students, experimental as well as control, still received six-week grades based on their actual quiz scores (not their pluspoints) and their other English-related activities, such as literature and composition. Thus, the reward system used in the experimental group supplemented but did not replace traditional grading.

Measures. All students were administered parallel forms of the Hoyum-Sanders Junior High School English test as pre- and posttests. The Hoyum-Sanders is a standardized test of language mechanics, covering such topics as complete sentences, capitalization, punctuation, word usage, and alphabetizing.

Results and Discussion

The data were analyzed using analysis of covariance, with the Hoyum-Sanders pretest as a covariate for the posttest. Table 1 summarizes the treatment means and standard deviations for each group, and Table 2 presents the results of the covariance analyses.

Insert Tables 1 and 2 Here

Tables 1 and 2 show that the ILE classes gained significantly more in language mechanics performance than did the control classes ($F(1,406) = 6.08$, $p < .02$). The experimental classes began the experiment with a lower pretest mean than did the control classes, but ended significantly higher. However, neither the treatment x pretest interaction ($F(1,405) < 1$) nor a test for a quadratic trend ($F(1,404 < 1$) approached statistical significance, indicating that equal gains were made by students of different levels of past performance.

The significant effect on academic achievement indicates that simply changing the way in which student scores are assigned and distributing a one-page newsletter each week can increase students' academic performance. Hawthorne effects are unlikely to explain these results, as both experimental and control students were experiencing a new schedule of instruction and a new curriculum. It is possible that the newsletter itself accounted for the treatment effects. No newsletter was given in the control group because it was felt to be unethical to publicize students' grades (there was no reluctance on the part of teachers or students to have pluspoints, which were equally available to all students, publicized in a newsletter). Further research might assess the use of Individual Learning Expectations without newsletters or find a comparable reward for the control group to remove this possible alternative explanation of treatment effects.

The failure to find any evidence of a pretest x treatment interaction or a quadratic trend favoring high and low achievers was not expected. The theory behind the ILE treatment assumes that low performing students will be helped by having a chance to be academically successful at their own level, and that high achieving students will be helped by being chal-

lenged to redouble their efforts to maintain maximum rewards.

The significance of this study is both practical and theoretical. Practically, it demonstrates that a simple change in the way students are rewarded for their academic performance can significantly increase that performance. If the results of this study stand in further replications, teachers will have a way to increase student achievement at virtually no cost in money and a minimal cost in additional time. Further, the achievement gains reported are probably much less than those that were actually experienced by the students in comparison to truly traditional instruction. The control group in this study was using the same focused, intensive schedule of instruction as the experimental group. This schedule of instruction has been found by Slavin (in press) to strongly increase student achievement even in the absence of the ILE treatment.

As a contribution to theory, this study suggests the potential power of variations in classroom reward structures. With the exception of the behavior modification literature, educational psychology and psychology in general have moved away from a focus on extrinsic rewards for academic performance to a concentration on motivation as a relatively immutable personality characteristic. These results must be replicated and component analysis must be done to isolate the effective portions of the ILE treatment, but this study suggests that attention to extrinsic motivation strategies that manipulate the consequences to students of increasing or decreasing their level of performance may help improve the effectiveness of schooling and improve understanding of motivation in the school setting.

Figure 1: Example of Pluspoints and New Base Scores

Student	Base Score	Adjusted Quiz Score	Plus-Points	Base Score	Adjusted Quiz Score	Plus-Points	Base Score
Antonio	28	34	3	27			
Bill	25	48	7	28			
Charlene	29	29	1	26			
Derrick	20	39	7	22			
Ed	31	39	3	30			
Francine	26	39	5	27			
Gary	37	50	7	38			
Helen	31	33	1	29			
Iris	34	32	0	31			
Jose	27	42	6	28			

Table 1

Treatment Means and Standard Deviations,

Hoyum-Sanders English Test

	Experimental (ILE)	Control
Pre		
M	69.24	70.90
SD	15.19	14.50
Post		
M	77.15	75.79
SD	15.43	13.94

Table 2

Results of Analyses of Covariance,

Treatment Effects on Academic Achievement

	F	d.f.	p<
Treatment	6.08	1,406	.02
Treatment x Pretest	1	1,405	n.s.
Treatment x Pretest Squared	1	1,404	n.s.

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